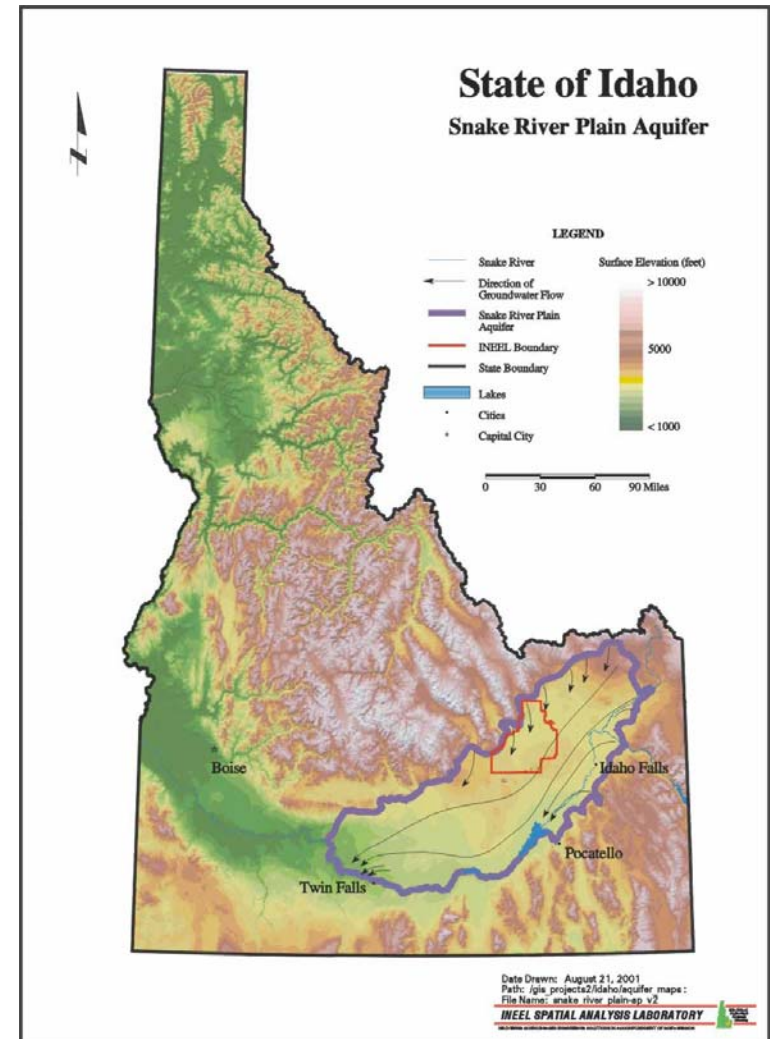


# INL Cleanup: Biogeoscience Research Opportunities?

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ERSP PI meeting



# INL

- 890 square mile site.
- Started in 1940's as artillery and testing range.
- 1950: AEC established National Reactor Testing Station.

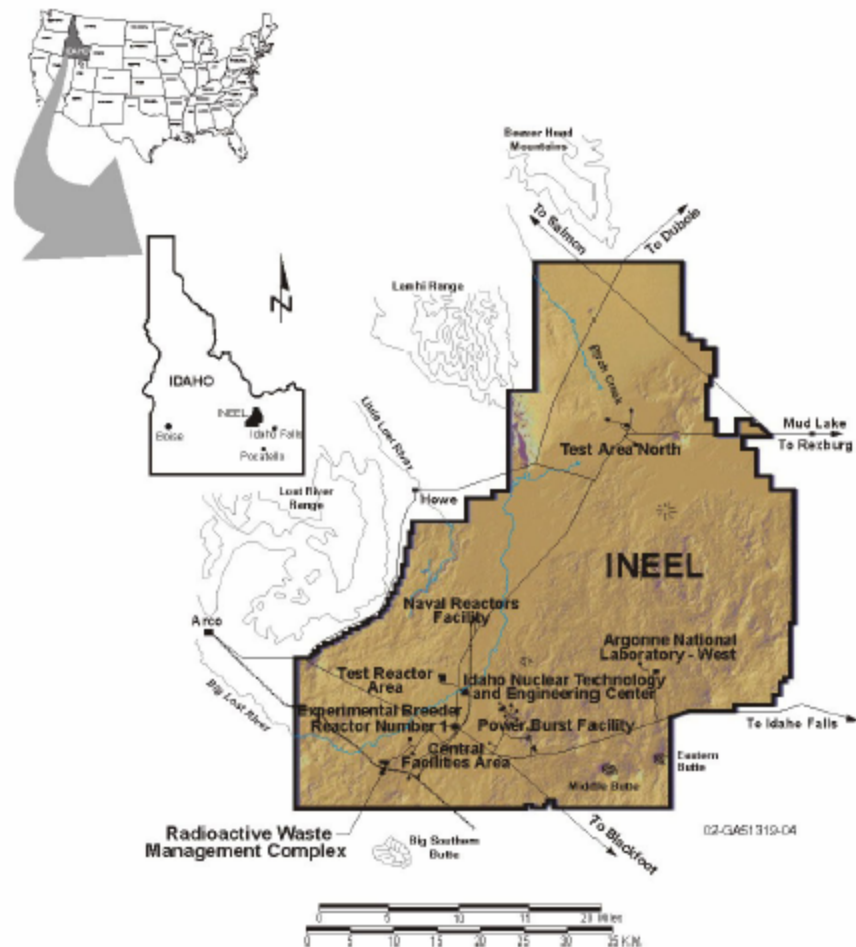
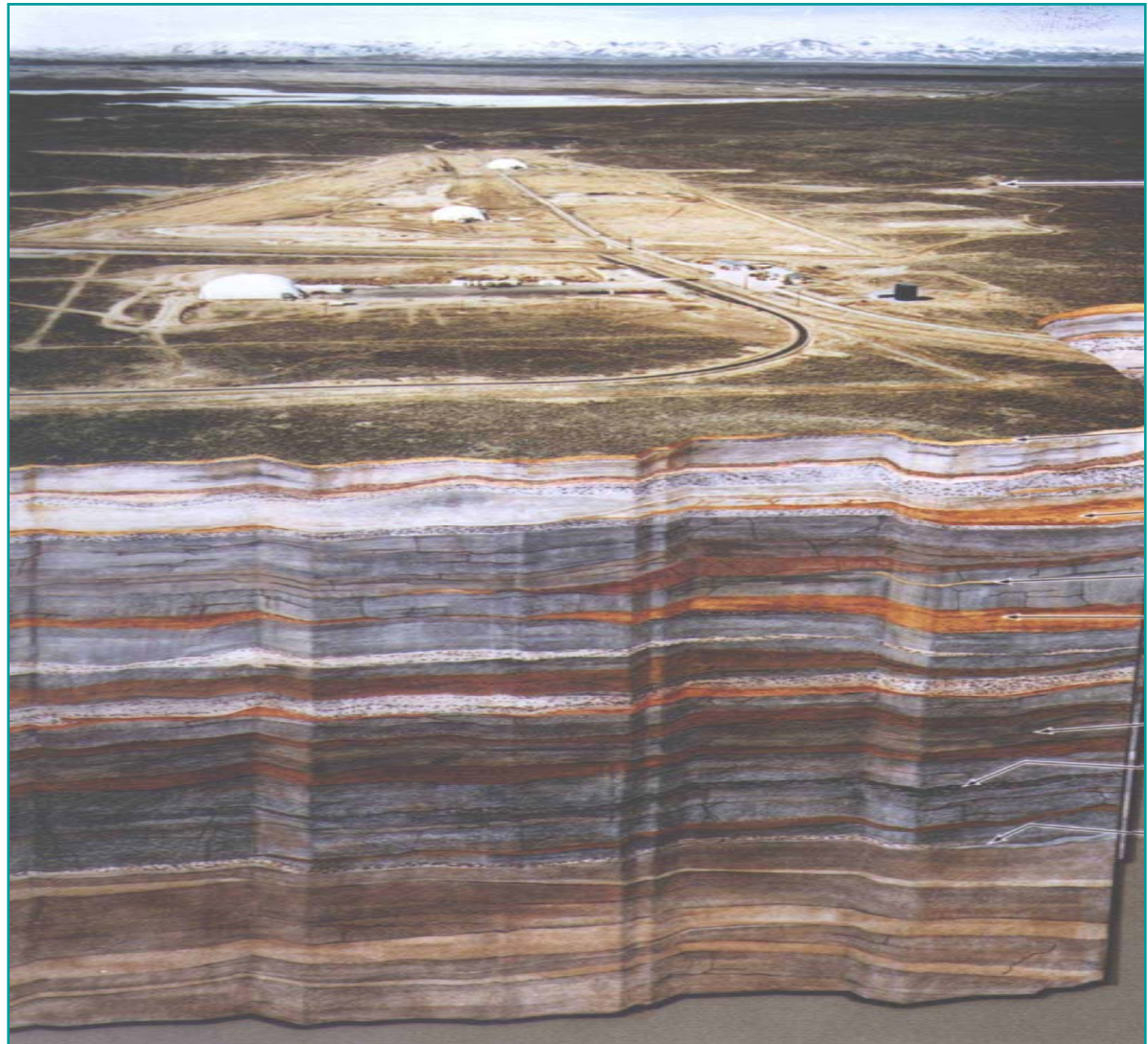


Figure 1. Location of the Radioactive Waste Management Complex and other major facilities at the Idaho National Engineering and Environmental Laboratory.

# Snake River Plain

- Series of basalt flows.
- Interbeds of sedimentary material (lower permeability)
- Aquifer typically at 400-600 fbls.
- Perched water bodies are important.



# INL History cont.

- 52 reactors have been built at INL over the years.
  - EBR-1 was first reactor in world to generate electricity.
  - 3 research reactors left today.
  - In 2002, named lead lab for DOE-NE.
- Reprocessed spent nuclear fuel (from Hanford, Navy) 1953-1992.

# INL Cleanup Status

## **Major remediation activities currently underway:**

- Removal of radionuclide contaminated soil
- Treatment of radionuclide and hazardous waste tank contents
- Solidification of spent fuel storage basin sludge
- Removal of mixed low level waste contaminated tank and piping systems
- Containment of subsurface radionuclide contamination
- Excavation of buried transuranic waste
- Treatment of sodium bearing high level liquid waste
- Vapor vacuum extraction of carbon tetrachloride from fractured rock
- Bioremediation of groundwater TCE plume
- Monitored natural attenuation of radionuclide and organic contamination groundwater plumes
- Decontamination and dismantlement (D&D) of reactor buildings and spent fuel reprocessing facilities

# Major Subsurface Cleanup Objectives—next 5 yrs

- Completion of bioremediation of TCE groundwater plume at TAN
- Implementation of a long-term groundwater monitoring program
- Excavation of soil around buried utilities and contaminated piping systems
- Clean closure of buried tank and piping systems

# Major Subsurface Cleanup Objectives—10 yrs

- Immobilization of Sr-90 contamination in perched water beneath INTEC
- Remediation or containment of radionuclide and organic contamination released from waste buried in the SDA
- Implementation of groundwater contamination remote sensing

# ICP's Wish List – 5 yrs

- Improved understanding of plutonium subsurface transport
- Improved methods for minimizing Sr-90 and uranium subsurface transport
- Improved methods for in situ identification of TRU waste targeted for removal from the SDA
- Methods for locating buried stainless steel piping



# ICP's Wish List – 10 yrs

- Methods for accelerating treatment of CCl<sub>4</sub> plume beneath the SDA
- Improved methods for remote monitoring of aquifer and perched water wells
- Methods for ensuring the long term effectiveness of remediation systems (e.g., how do we design and build capping systems that are “self-healing”?)

# INL Scientific Challenges - examples

- Predicting Sr-90 transport through complex, variably saturated deep vadose zone at INTEC
  - Concentrations up to 180,000 pCi/L seen in 110 ft. perched water.
  - Currently slightly above MCL in aquifer (460 fbls), but that believed to be from former injection well.
- Pu transport at Subsurface Disposal Area (SDA)
  - Sporadic Pu hits (<MCL of 5 pCi/L) in aquifer (580 fbls)—real, or false positives?
  - Could there be colloidal Pu transport?

# Examples of Scientific Challenges— cont.

- U at SDA
  - To estimate source term for future U transport, solubility calculations for U were made assuming oxidized conditions, water chemistry from lysimeters outside the pits.
  - But some actual measurements in pits far exceed calculated 1 mg/L U (max. 70 mg/L).
- Carbon tetrachloride at SDA
  - Chloroform detected, but wasn't disposed.
  - Abiotic or biotic reduction of CT? Can it be accelerated?